PSR-M-B1

Configurable safety module for evaluating various items of safety equipment

Data sheet
109466_en_01

 2024-05-27

1 Description

Intended Use

The safety module (basic module) is used to monitor single or two-channel signal generators and to control actuators.The safety module safely interrupts circuits.Configuration carried out with the PSRmodular software.The inputs are used to connect safe sensors or control devices.

The outputs are controlled after the incoming signals have been evaluated in accordance with the configuration.

Possible signal generators

- Emergency stop button
- Door locking mechanisms
- Light grids

Signal connections

- 8 safe digital inputs
- 2 safe digital output pairs
- 2 digital alarm outputs
- 2 reset inputs

Achievable safety integrity

- Suitable up to category 4, PL e (EN ISO 13849-1), SIL 3 (EN IEC 62061)

Additional features

- TBUS interface for connecting safe and non-safe IO modules as well as gateways
- USB 2.0 interface type Mini B
- Cross circuiting detection
- Optional pluggable screw or Push-in terminal blocks
- 22.5 mm housing width

Approvals

Observe these notes

WARNING: Risk of electric shock
Observe the safety regulations and installation notes in the corresponding section.

Make sure you always use the latest documentation.
It can be downloaded from the product at phoenixcontact.com/products.

This document is valid for the products listed in the “Ordering data” chapter.
This document meets the same requirements as the original operating instructions with respect to the contents.

2 Table of contents

3 Ordering data

Description	Type	Item no.	Pcs./Pkt.
Configurable safety module (basic module), 8 safe inputs, 2 safe outputs, 2 reset inputs, 2 signal outputs, 4 clock outputs, can be extended via TBUS, up to SIL 3, Cat. 4/PL e, plug-in screw terminal block, TBUS connector not included	PSR-M-B1-SDI8-SDO2-DO2-SC	1104981	1
Configurable safety module (basic module), 8 safe inputs, 2 safe outputs, 2 reset inputs, 2 signal outputs, 4 clock outputs, can be extended via TBUS, up to SIL 3, Cat. 4/PL e, plug-in Push-in terminal block, TBUS connector not included	PSR-M-B1-SDI8-SDO2-DO2-PI	1104972	1

Documentation	Type	Item No.	Pcs./Pkt.
User manual, English: PSRmodular: Configurable safety system	UM DE PSRmodular System	-	-
User manual, German: PSRmodular: System diagnostics	UM DE PSRmodular System-diagnose	-	-

Accessories	Type	Item no.	Pcs./Pkt.
Coding profile, is inserted into the slot on the plug or inverted header, red insulating material	CP-MSTB	1734634	100
Coding section, inserted into the recess in the header or the inverted plug, red insulating material	CR-MSTB	1734401	100
DIN rail connector, color: yellow, nominal current: 8 A (parallel contacts), rated voltage (III/2): 125 V, number of positions: 5, product range: TBUS5-22,5.., pitch: 3.81 mm, mounting: DIN rail mounting, locking: without, mounting: without, type of packaging: packed in cardboard, Item with gold-plated contacts, bus connectors for connecting with electronics housings, 5 parallel contacts	ME 22,5 TBUS 1,5/ 5-ST-3,81 YE	2200244	50
DIN rail connector, nominal current: 8 A (parallel contacts), rated voltage (III/2): 125 V, number of positions: 5, pitch: 3.81 mm, color: yellow, mounting: DIN rail, item with gold-plated contacts, bus connector for connecting to electronics housings, 5 parallel contacts	ME 22,5 TBUS 1,5/ 5-ST-3,81 YE - 1PCS	1225375	1
Optional memory block for the PSRmodular system for easy storage and backup of configuration data. When using the PSR-M-B3 base module, use the memory card from item revision 1105142-1.	PSR-M-MEMORY	1105142	1
Terminal block for filtering test pulses from safe semiconductor outputs with adjustable filter values (1.5 µF/ 11.5 µF), as well as for EMC filtering of 24 V signals up to an amperage of 2 A.	PSR-FTB/1.5/11.5	2904476	1

Accessories	Type	Item no.	Pcs./Pkt.
Terminal block for filtering test pulses from safe semiconductor outputs with adjustable filter values (20 µF/ 86 µF), as well as for EMC filtering of 24 V signals up to an amperage of 2 A.	PSR-FTB/20/86	2904477	1
USB connecting cable: USB plug type A to USB plug type Mini-B; length: 3 m	CABLE-USB/MINI-USB-3,0M	2986135	1
Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.25 mm² ... 6.0 mm², lateral entry, trapezoidal crimp	CRIMPFOX 6	1212034	1

4 Technical data

Hardware/firmware version	
HW/FW	≥ 00/4.1
The technical data and safety characteristics are valid as of the specified HW/FW version.	

Supply: A1/A2	
Rated control circuit supply voltage U_S	24 V DC -20 % / +20 % (external fuse, typically 4 A)
Rated control circuit supply voltage U_S	19.2 V DC ... 28.8 V DC
Rated control supply current I_S	typ. 55 mA (Outputs inactive) typ. 70 mA (Outputs active, without load)
Current consumption	max. 4 A (with full load)
Power consumption at U_S	typ. 1.32 W (Outputs inactive)
Inrush current	9.5 A (Δt = 1 ms at U_s)
Filter time	typ. 5 ms (at A1 in the event of voltage dips at U_s)
Cable length	max. 30 m
Protective circuit	Inverse-parallel protection against polarity reversal,

Digital inputs: IN1, IN2, IN3, IN4, IN5, IN6, IN7, IN8	
Number of inputs	8
Description of the input	Safety-related digital inputs EN 61131-2 type 1
Input voltage range "0" signal	0 V DC ... 5 V DC (for safe Off)
Input current range "0" signal	< 1 mA
Input voltage range "1" signal	15 V DC ... 28.8 V DC
Current consumption	typ. 8 mA (typically with U_S) max. 10 mA (at a control voltage of 28.8 V DC)
Filter time	min. 3 ms ±2 ms (adjustable) max. 250 ms ±2 ms (adjustable) Test pulse rate ≥ 2x set filter time, min. Test pulse rate = 10 ms
Max. permissible overall conductor resistance	max. 1.2 kΩ (Input and reset circuit at U_S)
Cable length	max. 100 m (per input)

Digital inputs: Reset inputs FBK1, FBK2	
Number of inputs	2
Description of the input	IEC 61131-2 type 3 non-safety-related (configurable)
Input voltage range "0" signal	0 V DC ... 5 V DC
Input current range "0" signal	< 1 mA
Input voltage range "1" signal	11 V DC ... 28.8 V DC
Current consumption	typ. 10 mA (typically with U_S) max. 13 mA (at a control voltage of 28.8 V DC)
Filter time	250 ms ±2 ms (Test pulse rate > 500 ms)
Max. permissible overall conductor resistance	1.2 kΩ (Input and reset circuit at U_S)
Cable length	max. 100 m (per input)
Protective circuit	Suppressor diode

Digital inputs: Enable inputs EN1, EN2	
Number of inputs	2
Input voltage range "0" signal	0 V DC ... 5 V DC
Input current range "0" signal	< 0.2 mA
Input voltage range "1" signal	8 V DC ... 28.8 V DC
Current consumption	typ. 0.7 mA (typically with U_S) max. 1 mA (at a control voltage of 28.8 V DC)
Filter time	100 ms ±2 ms (Test pulse duration) > 1 s (Test pulse rate)
Max. permissible overall conductor resistance	max. 12 kΩ
Cable length	max. 100 m (per input)
Protective circuit	Suppressor diode

Digital outputs: O1A, O1B, O2A, O2B	
Number of outputs	4 (can be used as 2 two-channel outputs)
Output description	Safety-related digital outputs PNP, OSSD IEC 61131-2 type 0.5 (observe limiting continuous current)
Nominal output voltage	24 V DC (Supply via A1)
Nominal output voltage range	18 V DC ... 27.6 V DC (U_S - 1.2 V)
Output voltage when switched off	< 1.5 V
Inrush current	max. 750 mA ($\Delta t \leq 1$ s)
Limiting continuous current	400 mA (per channel) 1.6 A (Total current of all safe digital outputs)
Leakage current	max. 500 µA
Ohmic load	min. 50 Ω (Observe limiting continuous current)
Max. capacitive load	max. 680 nF
Max. inductive load	max. 1.4 mH
Switching frequency	max. 1/4 x t_{Cycle} [Hz]
Test pulses	< 80 µs (Test pulse width of low test pulses) Test pulse rate for low test pulses > 2 x T_{Cycle} < 20 µs (Test pulse width, high test pulse) ≥ 1.5 s (Test pulse rate, high test pulse)
Error detection time at 1-channel structure	< 3.5 s (OFF state) < 4 x t_{Cycle} [ms] (ON state)
Cable length	max. 100 m (per output)
Protective circuit	Varistor
Overcurrent shut-down	≥ 750 mA
Short-circuit protection	Yes (self-limitation at 1.1 A)
Discharging circuit	Yes, internal

Alarm outputs: MO1, MO2	
Number of outputs	2
Output description	PNP, IEC 61131-2 Typ 0,1 non-safety-related
Voltage	24 V DC (via A1)
Output voltage range	18.2 V DC ... 27.8 V DC (U_S - 1 V)
Output voltage when switched off	max. 0.1 V
Maximum inrush current	1.1 A (Δt = 3 s at U_S)
Limiting continuous current	100 mA (per channel) 200 mA (Total current of all digital signal outputs)
Leakage current	max. 100 µA
Ohmic load	min. 180 Ω (Observe limiting continuous current)
Switching frequency	max. 1/4 x t_{Cycle} [Hz]
Cable length	max. 100 m (per output)
Protective circuit	Suppressor diode
Short-circuit protection	Yes (self-limitation at 1.1 A)
Discharging circuit	No

Clock outputs: T1, T2, T3, T4	
Number of outputs	4
Output description	PNP, IEC 61131-2 type 0.5
Voltage	24 V DC (via A1)
Nominal voltage range	18.2 V DC ... 27.8 V DC (U_S - 1 V)
Output voltage when switched off	max. 0.1 V
Maximum inrush current	1.1 A (Δt = 3 s at U_s)
Limiting continuous current	100 mA (per channel) 400 mA (Total current of all outputs)
Leakage current	max. 100 µA
Max. capacitive load	max. 470 nF
Max. inductive load	max. 2.4 mH
Test pulses	≤ 220 µs (Test pulse duration) Test pulse rate = 8 x t_{Cycle} [ms]
Cable length	max. 100 m (per output)
Short-circuit protection	Yes (self-limitation at 1.1 A)
Discharging circuit	Yes, internal

Times	
Response time	see user manual
Restart time	min. 5 s (Boot time) max. 10 s (Boot time)
Cycle time	see user manual

General data	
Nominal operating mode	100% operating factor
Degree of protection	IP20
Min. degree of protection of inst. location	IP54
Mounting type	DIN rail mounting
Mounting position	vertical or horizontal
Assembly note	Observe derating
Type of housing	Polyamide PA non-reinforced zinc yellow (RAL 1018)
Operating voltage display	1 x green LED
Status display	1 x LED (green), 1 x LED (orange), 1 x LED (blue) 2 x LED (green, red) 12 x LED (yellow)
Error indication	2 x LED (red)
Air clearances and creepage distances between the power circuits	
Rated insulation voltage	250 V AC
Rated surge voltage/insulation	See “Insulation coordination”
Protection class	III
Degree of pollution	2
Overvoltage category	II
Maximum power dissipation for nominal condition	6.24 W (with max. permissible load)
Note on power dissipation	See “Calculating the power dissipation”

Dimensions	Screw connection	Push-in connection
W x H x D	22.61 x 112.58 x 113.6 mm	22.61 x 107.74 x 113.6 mm

Connection data	Screw connection	Push-in connection
Conductor cross section rigid	0.2 mm² … 2.5 mm²	0.2 mm² … 2.5 mm²
Conductor cross section flexible	0.2 mm² … 2.5 mm²	0.2 mm² … 2.5 mm²
Conductor cross-section AWG	24 … 12	24 … 14
Stripping length	7 mm	10 mm
Screw thread	M3	
Tightening torque	0.5 Nm … 0.6 Nm	

Ambient conditions	
Ambient temperature (operation)	-10 °C … 55 °C (observe derating)
Ambient temperature (storage/transport)	-20 °C … 85 °C
Max. permissible relative humidity (operation)	95 % (non-condensing)
Max. permissible humidity (storage/transport)	95 % (non-condensing)
Maximum altitude	≤ 2000 m (Above sea level)
Information on operating height	See the “Using PSR devices at altitudes greater than 2000 m above sea level” section
Shock	10g for Δt = 16 ms (continuous shock, 1000 shocks in each space direction)
Vibration (operation)	10 Hz … 150 Hz, 2g

Conformance/Approvals	
CE	CE-compliant
The full EC Declaration of Conformity can be downloaded for the product at phoenixcontact.com/products.	
Approvals	

Safety data	
Stop category according to IEC 60204	0

Safety parameters in accordance with IEC 61508 - high demand	
IEC 61508 - High-demand for 2-channel wiring	
Equipment type	Type B
HFT	1
SIL	3
PFH_D	6.86×10^{-9}
Demand rate	< 12 Months
Proof test interval	240 Months
Mission time	240 Months

Safety parameters in accordance with IEC 61508 - high demand	
IEC 61508 - High-demand for 1-channel wiring	
Equipment type	Type B
HFT	0
SIL	2
PFH_D	6.86×10^{-9}
Demand rate	< 12 Months
Proof test interval	240 Months
Mission time	240 Months

Safety parameters according to EN ISO 13849-1	
Performance level	e (2-channel wiring) d (1-channel wiring)

Safety parameters in accordance with EN IEC 62061	
SIL	3 (2-channel wiring) 2 (1-channel wiring)

5 Interface type (ZVEI classification)

Digital inputs : IN1, IN2, IN3, IN4, IN5, IN6, IN7, IN8				
Source/destination	**Interface type**	**Additional measure**	**Source/destination**	**Suitable interface type**
Destination	C0		Source	-

Interface type C0 - Destination			
Parameter	**min.**	**typ.**	**max.**
Test pulse duration t_i	3 ms	configurable	250 ms (configurable)
Test pulse interval T	2x set filter time	-	-
Input resistance R	3 kΩ	3.2 kΩ	-
Input capacitance C_L	-	47 nF	51.7 nF
Inductive load L_L	-	10 pH	-
Additional measure M			

Digital inputs : Reset inputs FBK1, FBK2				
Source/destination	**Interface type**	**Additional measure**	**Source/destination**	**Suitable interface type**
Destination	C0		Source	-

Interface type C0 - Destination			
Parameter	**min.**	**typ.**	**max.**
Test pulse duration t_i	-	-	250 ms
Test pulse interval T	0.5 s	-	-
Input resistance R	1.8 kΩ	2.4 kΩ	-
Input capacitance C_L	-	47 nF	51.7 nF
Inductive load L_L	-	10 pH	-
Additional measure M			

Digital inputs : Enable inputs EN1, EN2				
Source/destination	**Interface type**	**Additional measure**	**Source/destination**	**Suitable interface type**
Destination	C0		Source	-

Interface type C0 - Destination			
Parameter	**min.**	**typ.**	**max.**
Test pulse duration t_i	-	-	100 ms
Test pulse interval T	1 s	-	-
Input resistance R	-	30 kΩ	-
Input capacitance C_L	-	22 nF	24 nF
Inductive load L_L	-	10 pH	-
Additional measure M			

Digital outputs : O1A, O1B, O2A, O2B				
Source/destination	**Interface type**	**Additional measure**	**Source/destination**	**Suitable interface type**
Source	C2		Destination	C0, C1, C2, C3

Interface type C2 - Source			
Parameter	**min.**	**typ.**	**max.**
Test pulse duration t_i	-	-	80 µs
Test pulse interval T	-	4 x t_{Cycle}	-
Nominal current I_N	-	-	400 mA
Leakage current $I_{Leakage}$	-	-	500 µA
Input capacitance C_L	-	-	680 nF
Inductive load L_L	-	-	1.4 mH (L_L)
Additional measure M			

Alarm outputs : MO1, MO2				
Source/destination	**Interface type**	**Additional measure**	**Source/destination**	**Suitable interface type**
Source	C0	M	Destination	-

Interface type C0 - Source			
Parameter	**min.**	**typ.**	**max.**
Test pulse duration t_i	-	-	-
Test pulse interval T	-	-	-
Nominal current I_N	-	-	100 mA
Leakage current $I_{Leakage}$	-	-	4.5 mA
Load capacitance C_L	-	-	-
Inductive load L_L	-	-	-
Additional measure M	- No test pulses are emitted at the output.		

Clock outputs : T1, T2, T3, T4				
Source/destination	**Interface type**	**Additional measure**	**Source/destination**	**Suitable interface type**
Source	C0		Destination	-

Interface type C0 - Source			
Parameter	**min.**	**typ.**	**max.**
Test pulse duration t_i	-	-	220 µs
Test pulse interval T	-	8 x t_{Cycle}	-
Nominal current I_N	-	-	100 mA
Leakage current $I_{Leakage}$	-	-	4.5 mA
Input capacitance C_L	-	-	470 nF
Max. inductive load L_L	-	-	2.4 mH
Additional measure M			

6 Notes regarding documentation

6.1 Identification of warning notes

This symbol indicates hazards that could lead to personal injury.

There are three signal words indicating the severity of a potential injury.

DANGER Indicates a hazard with a high risk level. If this hazardous situation is not avoided, it will result in death or serious injury.

WARNING Indicates a hazard with a medium risk level. If this hazardous situation is not avoided, it could result in death or serious injury.

CAUTION Indicates a hazard with a low risk level. If this hazardous situation is not avoided, it could result in minor or moderate injury.

This symbol together with the **NOTE** signal word warns the reader of actions that might cause property damage or a malfunction.

Here you will find additional information or detailed sources of information.

6.2 Validity

This data sheet is valid for the described product(s) from the hardware/firmware version specified in the technical data.

6.3 Target group

This data sheet is therefore aimed at:

– Qualified personnel who plan and design safety equipment for machines and systems and are familiar with regulations governing occupational safety and accident prevention.
– Qualified personnel who install and operate safety equipment in machines and systems.

Qualified personnel:

Qualified personnel are people who, because of their education, experience, and instruction and their knowledge of relevant standards, regulations, accident prevention, and service conditions, have been authorized by those responsible for the safety of the system to carry out any required operations and who are able to recognize and avoid any possible dangers.

Requirements:

Knowledge of the following topics is required:

– Handling safety components
– Valid EMC regulations
– Valid regulations governing occupational safety and accident prevention

7 Safety regulations and installation notes

WARNING: Death, serious personal injury or damage to equipment

Depending on the application, incorrect handling of the device may pose serious risks for the user or cause damage to equipment.

- Observe all the safety notes and warning instructions provided in this chapter and elsewhere in this document.

NOTE: Electrostatic discharge!

Electrostatic discharge can damage or destroy components.

- When handling the device, observe the necessary safety precautions against electrostatic discharge (ESD) in accordance with EN 61340-5-1 and IEC 61340-5-1.

Direct/indirect contact

- Protection against direct and indirect contact according to VDE 0100 Part 410 must be ensured for all components connected to the system.

In the event of an error, parasitic voltages must not occur (single-fault tolerance).

Power supply units for 24 V supply

- Only use power supply units with safe isolation and SELV/PELV.
- Protect the 24 V area with a suitable external fuse.
- Make sure that the power supply unit is able to supply **four times** the nominal current of the external fuse, to ensure that it trips in the event of an error.
- Make sure that the output voltage of the voltage supply does not exceed 32 V even in the event of error.

Startup, mounting, and modifications

Startup, mounting, modifications, and upgrades may only be carried out by qualified personnel.

- Before working on the device, disconnect the power.
- Carry out wiring according to the application. Refer to the “Application examples” section for this.

Reliable operation is only ensured if the device is installed in housing protected from dust and humidity.

- Install the device in housing protected from dust and humidity (min. IP54).

Mismatching and polarity reversal of connections

- Take measures to prevent mismatching, polarity reversal, and manipulation of connections.

In operation

During operation, parts of electrical switching devices carry hazardous voltages.

- Protective covers must not be removed when operating electrical switching devices.

For emergency stop applications, automatic startup of the machine can pose serious risks for the user.

- The machine must be prevented from restarting automatically by a higher-level controller.

With the manual, monitored reset device, a machine start may not be triggered in accordance with EN ISO 13849-1.

Inductive loads can destroy the outputs.

- Connect a suitable and effective protective circuit to inductive loads.
- Implement the protective circuit parallel to the load and not parallel to the switch contact.

The device is a Class A product.

- Observe the requirements for noise emission for electrical and electronic equipment (EN 61000-6-4).
- Implement appropriate precautions against noise emission.

Faulty devices

The devices may be damaged following an error. Correct operation can no longer be ensured.

- In the event of an error, replace the device.

Only the manufacturer or their authorized representative may perform the following activities. Otherwise the warranty is invalidated.

– Repairs to the device
– Opening the housing

Replacing the device

- Dispose of the device in the following circumstances:

– At the end of its mission time

🛈 See “Technical data” section.

– In the event of a fault

7.1 Safety of machines or systems

Draw up and implement a safety concept

The machine or system manufacturer and the operator are responsible for the safety of the machine or system and the application in which the machine or system is used. In order to use the device described in this document, you must have drawn up an appropriate safety concept for your machine or system. This includes a risk assessment in accordance with the directives and standards specified in the EC Declaration of Conformity, as well as other standards.

Risk assessment, validation and function test

- Before using the device, perform a risk assessment on the machine or system.
- Validate your entire safety system.
- Carry out a new validation every time you make a safety-related modification.
- Perform a function test on a regular basis.

Achievable safety integrity

The functional safety is ensured for the device as a single component. However, this does not guarantee functional safety for the entire machine or system. In order to be able to achieve the desired safety level for the entire machine or system, define the safety requirements for the machine or system as well as how to implement them from both a technological and an organizational perspective.

8 Transport, storage, and unpacking

8.1 Transport

The device is delivered in cardboard packaging.

- Observe the instructions on how to handle the package indicated on the packaging.

Suitable transport packaging

- Only transport the device in its original packaging or in packaging suitable for transport.

Technical data and environmental conditions

- For transport, observe the humidity and air pressure specifications, and the temperature range.
  🛈 See Section “Technical data”.

8.2 Storage

Suitable storage location

The storage location must meet the following requirements:

– Dry

– Protected against unauthorized access

– Protected against harmful environmental influences such as UV light

Technical data and environmental conditions

- For storage, observe the humidity and air pressure specifications, and the temperature range.
  🛈 See Section “Technical data”.

8.3 Unpacking

The device is delivered in packaging together with a packing slip that provides installation instructions.

Observing the packing slip

- Read the entire packing slip carefully.
- Retain the packing slip.

Checking the delivery

- Check the delivery for damage and completeness.
- Submit any claims for transport damage immediately.

Scope of supply

Refer to the ordering data for the standard scope of supply for the product.
🛈 See Section “Ordering data”.

9 Function description

9.1 Digital inputs

The base module has 8 safe digital inputs in accordance with IEC 61131-2. The inputs are used to connect safe sensors or control devices

9.2 Reset/FBK inputs

The basic module has 2 independent inputs that are configured as the feedback circuit for monitoring external actuators, such as contactors with forced guidance.

The inputs can also be configured with a manual reset function.

Reset/FBK inputs are specifically assigned to the outputs:

FBK1 is assigned to output pair O1A/O1B and FBK2 is assigned to output pair O2A/O2B.

9.3 Clock outputs

The base module has 4 clock outputs. Depending on the configuration, the asynchronous test clocks provide cross-circuit detection at the inputs of the respective safety module. A cross-circuit can only be detected between different test clocks. Up to 4 inputs can be supplied by a single clock output.

9.4 Digital signal outputs

Non-safe signals can be transmitted to a PLC or other signal generators via the signal outputs. Inputs, outputs, and any intermediate information can be sent to the signal output.

9.5 Safe digital outputs

The module has two digital output pairs. The outputs are controlled after the incoming signals have been evaluated in accordance with the configuration. Each output pair can achieve up to PL e and SIL 3.

9.6 ENABLE inputs

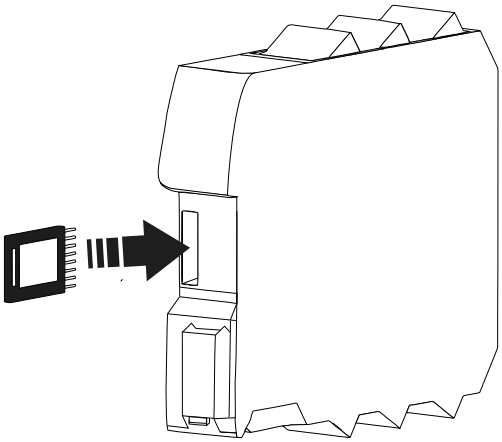
The module has two ENABLE inputs, which must be supplied with 24 V DC in order to ensure operation.

9.7 TBUS interface

The device is equipped with a TBUS interface for connecting extension modules and gateways.

Connect a maximum of 14 extension modules to one basic module.

9.8 PSR-M-MEMORY



The configuration is always saved to the internal device memory of the base module.

The PSR-M-B1 base module supports the optional installation of a backup memory (PSR-M-Memory) where the configuration of the application project can be saved.

The slot where the memory card is inserted is located on the back of the base modules.

Data is written to the memory module every time a new project is written to the base module by the notebook/PC.

NOTE: Data loss

- Only connect/remove the PSR-M-MEMORY when the base module is switched off.

9.9 Multiple transfer

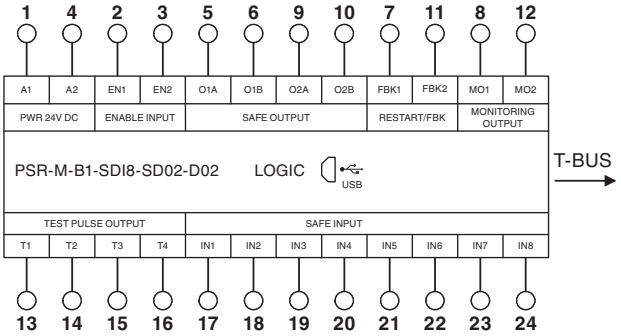
To configure multiple base modules without using the PC and USB connection, the desired configuration can be saved to a PSR-M-MEMORY. This can then be used to transfer the data to the base modules that need to be configured by simply inserting the memory module in the base module and switching it on.

NOTE: Data loss

If the file on the memory module differs from the file on the base module, the configuration data on the base module will be overwritten and irretrievably deleted. In this case, the COM and ENB LEDs on the module will flash rapidly. All existing data on the module will be lost.

10 Block diagram

Figure 1 Block diagram



Key:

A1	24 V DC supply connection
A2	0 V supply connection
O1A/O1B/ O2A/O2B	Safe digital output pairs
EN1/EN2	ENABLE input
FBK1/FBK2	Feedback/reset input
MO1 ... MO2	Programmable signal output
T1 ... T4	Clock output
IN1 ... IN8	Safe digital input

10.1 Insulation coordination

	Logic	Housing
Logic	-	4 kV BI
Housing		-

Key

BI	Basic insulation

11 Derating

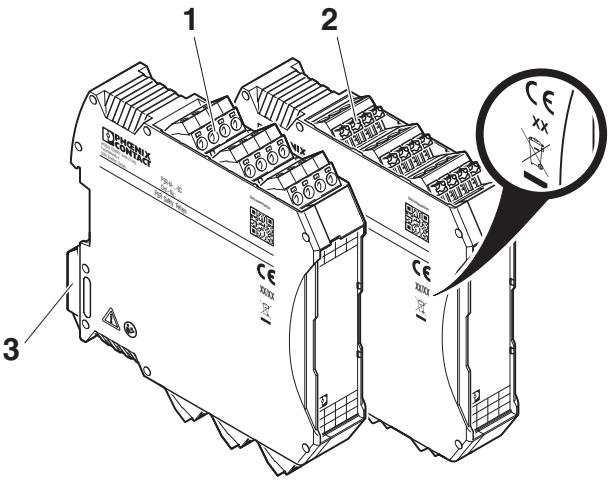
11.1 Vertical or horizontal mounting position

- The module can be operated at an ambient temperature of maximum 55°C at ≤ 24 V DC.
- With a rated control supply voltage ≤ 28.8 V DC, a maximum ambient temperature of 40° is permitted.
- Mounting on a vertical or horizontal DIN rail
- Devices mounted next to each other without spacing

12 Operating and indication elements

12.1 Connection versions

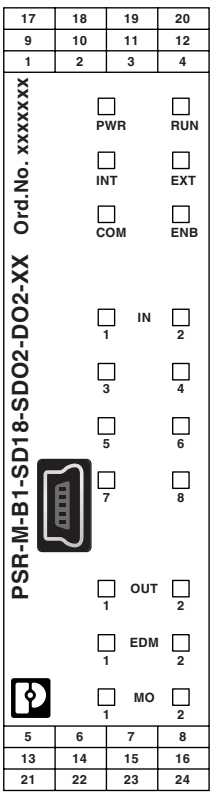
Figure 2 Connection versions



1 Pluggable screw terminal block
2 Pluggable Push-in terminal block
3 Metal lock for fixing to DIN rail

The year the device was constructed can be found underneath the CE designation on the housing.

12.2 Indication elements



Designation	Color	Function/status indicator
PWR	Green	Diagnostic indicator for the power supply
RUN	Green	Operating status indicator
INT	Red	Diagnostic indicator for internal errors
EXT	Red	Diagnostic indicator for external errors
COM	Orange	Status and diagnostic indicator for the communication between the PSRmodular software and PSRmodular basic module
ENB	Blue	Additional diagnostic indicator for the basic module
IN1 ... IN8	Yellow	Status indicator for the safe digital inputs
OUT1 ... OUT2	Green/red	Status indicator for the safe digital outputs
EDM1 ... EDM2	Yellow	Status indicator for the EDM circuits
MO1 ... MO2	Yellow	Status indicator for the signal outputs

12.3 Optional terminal coding

The device connection terminal blocks are **not** coded as standard.

The optional coding accessories can provide you with increased safety against connection mismatching and reverse polarity.
See section “Ordering data”.

If you do not use the coding accessories, ensure that alternative validation measures are taken.

Coding system

The terminal blocks can be coded by using coding sections and coding profiles.

Coding sections are plugged onto the terminal block header in the device housing.

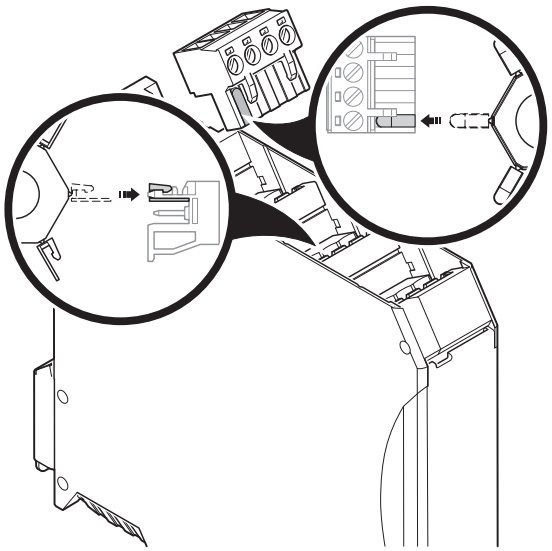
Coding profiles are plugged into the groove of the pluggable terminal block.

Various combinations can be used to create a coding system for the device terminal blocks.

Attaching coding elements

1. Push a coding section onto the terminal block header in the device housing.
   Remove the coding section from the coding star.
2. Push a coding profile into the groove of the terminal block.
   Remove the coding profile from the coding star.

Figure 3 Attach coding elements



13 Mounting and removing

Assembly and disassembly are described in the PSRmodular system manual.

14 Wiring

- Connect the cables to the connection terminal blocks using a screwdriver.

Figure 4 Connecting the cables for PSR-...-SC (screw terminal block)

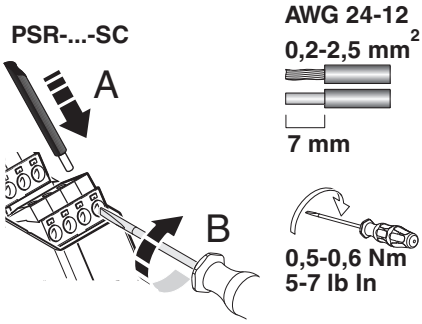
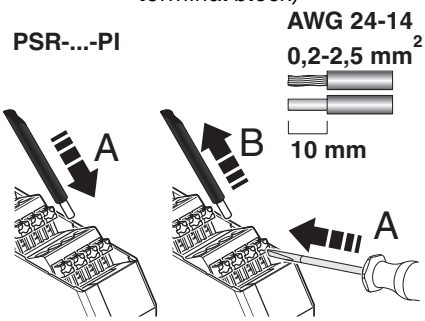


Figure 5 Connecting the cables for PSR-...-PI (Push-in terminal block)



It is recommended that ferrules are used to connect stranded cables.

Use the CRIMPFOX 6 crimping tool from Phoenix Contact.

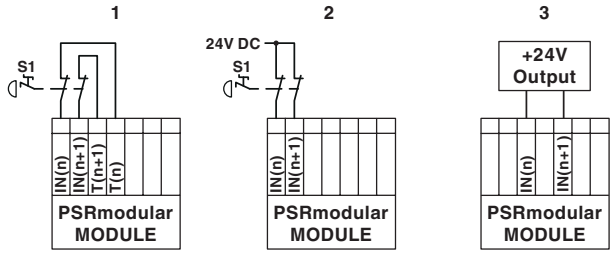
The tool enables the reliable processing of ferrules and easy removal of conductors with ferrules from the connection terminal blocks.

For compliance with UL approval, use copper wire that is approved up to 60°C/75°C.

14.1 Signal generator connection versions

- Connect suitable signal generators to safe digital inputs IN1...IN8.

Figure 6 Signal generator connection versions



1 Two-channel connection with cross-circuit monitoring

2 Two-channel connection without cross-circuit monitoring

3 Two-channel connection with **external** cross-circuit detection by the signal generator

14.2 Start and feedback circuit connection variants

Automatic start

- Autostart without monitored contact extension is parameterized using the PSRmodular software.

Manual, monitored start

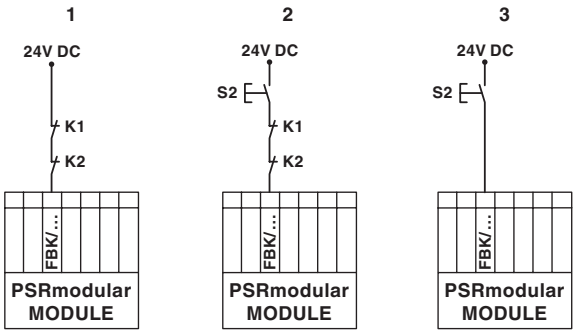
- Connect a reset button.

A connected reset button is monitored.

Start and feedback circuit

- Place the relevant N/C contacts in the feedback circuit to monitor external contactors or extension devices with force-guided contacts.

Figure 7 Start and feedback circuit connection variants



1 Automatic start with monitored contact extension

2 Manual, monitored start with monitored contact extension

3 Manual, monitored start

15 Startup

- Startup is described in the PSRmodular system manual.

16 Calculating the power dissipation

The total power dissipation of the safety module is based on the input power dissipation and the contact power dissipation for the same and for different load currents.

Power dissipation of the logic (A1/A2)

$P_{Logic} = U_B = 1320$ mW

Power dissipation of the ENABLE inputs (EN1 ... EN2)

$P_{EN} = 33$ mW

Power dissipation per safe input (IN1 ... IN8)

$P_{IN} = 192$ mW

Power dissipation per feedback/RESTART input (FBK1, FBK2)

$P_{FBK/RESTART} = 240$ mW

Power dissipation per signal output (MO1, MO2)

$P_{MO} = I_{MO} * 1\ V + 96$ mW

Total power dissipation of all signal outputs (MO1 + MO2)

$P_{MO\_Total} = (I_{MO1} + I_{MO2}) * 1\ V + (c * 96\ mW)$

Power dissipation per safe output (O1A, O1B, O2A, O2B)

$P_O = I_O * 1.2\ V + 42$ mW

Total power dissipation of all safe outputs (O1A + O1B + O2A + O2B)

$P_{O\_Total} = (I_{O1A} + I_{O1B} + I_{O2A} + I_{O2B}) * 1.2\ V + (d * 42\ mW)$

Power dissipation per clock output (T1 ... T4)

$P_T = I_T * 1\ V$

Total power dissipation of all clock outputs (T1 + T2 + T3 + T4)

$P_{T\_Total} = (I_{T1} + I_{T2} + I_{T3} + I_{T4}) * 1\ V$

Total power dissipation of the module

$P_{Total} = P_{Logic} + P_{EN} + a * P_{IN} + b * P_{FBK/RESTART} + P_{MO\_Total} + P_{O\_Total} + P_{T\_Total}$

Key:

P	Power dissipation
U_B	Applied operating voltage
P_{Logic}	Power dissipation of the logic via A1/A2
P_{EN}	Power dissipation of the enable inputs EN1 and EN2
P_{IN}	Power dissipation per used safe input
$P_{FBK/RESTART}$	Power dissipation per feedback/RE-START input
P_{MO}	Power dissipation per signal output
P_{MO_Total}	Total power dissipation of all signal outputs
P_O	Power dissipation per safe output
P_{O_Total}	Total power dissipation of all safe outputs
P_T	Power dissipation per clock output
P_{T_Total}	Total power dissipation of all clock outputs
P_{Total}	Total power dissipation of the module
I_T	Current drawn at a clock output
I_{MO}	Current drawn at a signal output
I_O	Current drawn at a safe output
a	Number of safe inputs used
b	Number of feedback/RESTART inputs used
c	Number of signal outputs used
d	Number of safe outputs used

17 Function test/proof test

Warning: Risk of injury or damage to equipment due to unintentional system states or incorrect responses

The safety module is in the startup phase, i.e., unintentional system states or incorrect responses cannot be ruled out.

- Make sure that triggering the safety demand does not endanger people or equipment.
- Do not enter any hazardous areas and make sure that no other persons can access the danger zone either.

Implementation:

After the project has been successfully loaded on the base module, perform a function test to ensure the correct execution of the safety logic and all of the cabling.

18 Diagnostics

Plausibility errors are deleted when the supply voltage is switched off (power down reset).

In the event of an error or fault that is not listed, please contact Phoenix Contact.

Key:

○ LED OFF
● LED ON
✷ LED flashing slowly
✹ LED flashing quickly

18.1 Diagnostic indicators for initialization/configuration phase

LED status										Meaning	Corrective
PWR	RUN	INT	EXT	COM	ENB	IN1 ... IN8	OUT1 ... OUT2	EDM1 ... EDM2	MO1 ... MO2		
green	green	red	red	orange	blue	yellow	green/ red	yellow	yellow		
○	○	○	○	○	○	○	○	○	○	Device is switched off, no power supply at A1/ A2	
●	●	●	●	●	●	●	● red	●	●	Switching on - start-up test	
●	○	○	○	● (max. 1 s)	● (max. 1 s)	○	○	○	○	PSRmodular Memory detected	
●	○	○	○	5x ✷	5x ✷	○	○	○	○	Loading or writing the configuration from or onto PSRmodular memory	
●	○	○	○	✷	○	○	○	○	○	Internal configuration absent	
●	○	○	○	✹	○	○	○	○	○	Address incorrect or no configured extension module	Make sure that the connected hardware configuration (addressing) matches the system configuration in the PSRmodular Software.
●	✷	○	○	✹	○	○	○	○	○	Invalid hardware configuration	Make sure that the connected hardware configuration (base and extension modules) matches the system configuration in the PSRmodular Software

LED status										Meaning	Corrective
PWR	RUN	INT	EXT	COM	ENB	IN1 ... IN8	OUT1 ... OUT2	EDM1 ... EDM2	MO1 ... MO2		
green	green	red	red	orange	blue	yellow	green/ red	yellow	yellow		
●	○	○	○	●	○	○	○	○	○	PSRmodular Software connected, PSR-M-B1 waiting for PSRmodular Software restart	

18.2 Diagnostic indicators for initialization/configuration phase

LED status										Meaning
PWR	RUN	INT	EXT	COM	ENB	IN1 ... IN8	OUT1 ... OUT2	EDM1 ... EDM2	MO1 ... MO2	
green	green	red	red	orange	blue	yellow	green/ red	yellow	yellow	
●	●	○	○	○	●	○	○	○	○	Normal operation without errors: affected input or output is inactive
●	●	○	○	○	●	●	● green	○	●	Normal operation without errors: affected input or output is active
●	●	○	○	○	●	● / ○	○	●	● / ○	Reset signal expected for the affected safe output
●	●	○	●	○	●	● / ○	○	✷	● / ○	Implausible feedback signal at the affected safe output
●	●	○	●	○	○	✷	● / ○	○	● / ○	Incorrect signal at affected input

18.3 Diagnostic indicators and troubleshooting

LED status										Meaning	Corrective
PWR	RUN	INT	EXT	COM	ENB	IN1 ... IN8	OUT1 ... OUT2	EDM1 ... EDM2	MO1 ... MO2		
green	green	red	red	orange	blue	yellow	green/ red	yellow	yellow		
●	○	2x ✷ or 3x ✷	○	○	○	○	● red	○	○	Internal error	Perform a power down reset with subsequent function test. If the error occurs again after the function test, replace the device.
●	○	4x ✷	○	○	○	○	4x ✷ red	○	○	Error at affected output	- Check wiring of affected output - Perform power down reset with subsequent function test - If the error occurs again after the function test, replace the device
●	○	5x ✷	○	○	○	○	○	○	○	Communication error between the base module and the extension module: Communication between the safety module and the safe extension module via the DIN rail connector (PSR-TBUS) has been interrupted	Check whether all safe extension modules are correctly connected to the base module. A connection is correct if there is a PSR-TBUS connector under each extension module and the connection has been established properly (the module must snap into place). Check whether the power supply at each extension module has been connected and switched on correctly.
●	○	●	○	○	○	○	○	○	○	Error at extension module	- Restart the system - Check which module is in the error state
●	○	6x ✷	○	6x ✷	○	○	○	○	○	PSRmodular memory error	- Check whether the PSRmodular Memory is inserted correctly - Perform a power down reset - If the error occurs again after the power down reset, replace the PSRmodular Memory

19 Application example

19.1 General application information for the PSR-modular system

Warning: Loss of safety function or damage to the device

The use of unsuitable power supplies and the incorrect connection of the power supply can result in the loss of the safety function or damage to the device.

- Observe the following information

System level

– All the reference grounds of a PSRmodular system must be connected together. This also applies to the reference ground of connected sensors.

Module level

– Make sure that the supply voltage of the FBK inputs is not higher than the communications power at A1/A2. Ideally, use the same power supply unit.
– Use the same power supply unit for the power supply of the outputs (24V/0V) and the communications power at A1/A2.

19.2 Emergency stop monitoring/manual, monitored start

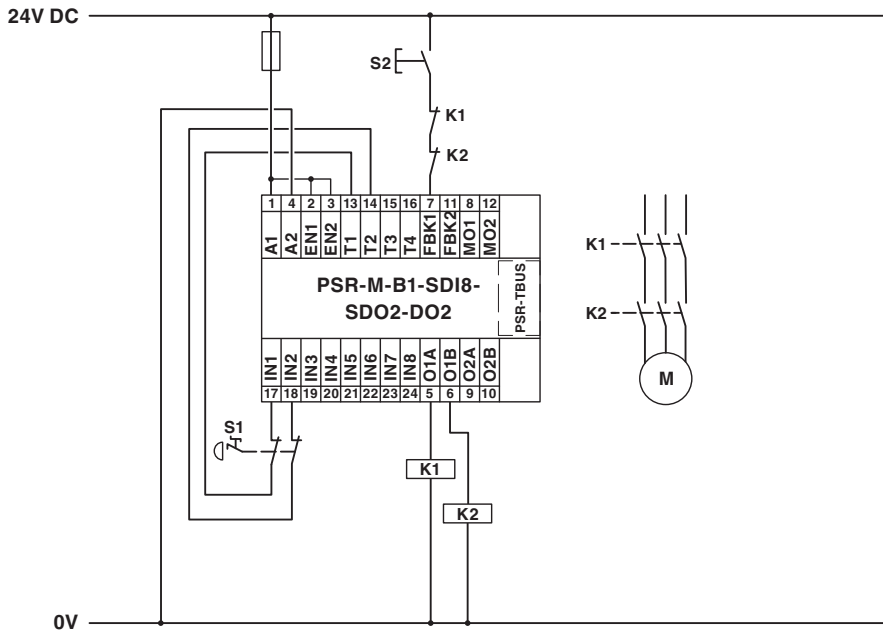
Application description:

– Two-channel emergency stop monitoring
– Manual, monitored start
– With cross-circuit detection in the sensor circuit
– Monitoring of external, force-guided contactors

Achievable safety integrity:

– Suitable up to category 4, PL e (EN ISO 13849-1), SIL 3 (EN IEC 62061)

Figure 8 Emergency stop monitoring/manual, monitored start



Key:

S1	Emergency stop button
S2	Manual reset device
K1/K2	Force-guided contactors

20 Device replacement, device defect, and repair

20.1 Device replacement

The device can be replaced, if necessary.

If you need to replace the device, proceed as described in the following section:

– Mounting and removal
– Wiring

Observe the device type and version

The new device must meet the following requirements:

– Same device type
– Same or later version

20.2 Device defect and repair

Do not open the housing

Repairs may only be carried out by Phoenix Contact. Do not open the housing. If the housing is opened, the function of the device can no longer be ensured.

Faulty devices

- Please contact Phoenix Contact.

21 Maintenance, decommissioning, and disposal

21.1 Maintenance

The device requires no maintenance during the permissible mission time. Refer to the technical data for the mission time of the device.

See “Technical data” section.

Depending on the application and connected I/O devices, you should test the function of the I/O devices and the safety chain regularly.

Observe the relevant manufacturer specifications for carrying out maintenance on connected I/O devices.

21.2 Decommissioning and disposal

Carry out decommissioning according to the requirements of the machine or system manufacturer.

When decommissioning the system or parts of the system, ensure the following for the devices used.

The device continues to be used only as intended:

- Observe the storage and transport requirements.

See “Transport, storage, and unpacking” section.

The device is not used any more:

The symbol with the crossed-out trash can indicates that this item must be collected and disposed of separately from other waste.
Phoenix Contact or public collection sites will take the item back for free disposal. For information on the available disposal options, visit www.phoenixcontact.com.

Device disposal

- Do not dispose of the device with household waste; it should instead be disposed of in accordance with the currently applicable national regulations.

Packaging disposal

- Dispose of packaging materials that are no longer needed (cardboard packaging, paper, bubble wrap sheets, pillow bags, etc.) with household waste in accordance with the currently applicable national regulations.

22 Attachment

22.1 Using PSR devices at altitudes greater than 2000 m above sea level

The following section describes the special conditions for using PSR devices at altitudes greater than 2000 m above sea level.
Observe the relevant device-specific data (technical data, derating, etc.) according to the product documentation for the individual device.

Using the device at altitudes **greater than 2000 m above sea level up to max. 4500 m above sea level** is possible under the following conditions:

1. Limit the rated control circuit supply voltage (U_S) in accordance with the table below. Observe the technical data for the device.

U_S according to the technical data for the device	U_S when used at altitudes greater than 2000 m above sea level
< 150 V AC/DC	U_S according to the technical data for the device still valid
> 150 V AC/DC	Limited to max. 150 V AC/DC

2. Limit the maximum switching voltage in accordance with the table below. Observe the technical data for the device.

Max. switching voltage according to the technical data for the device	Max. switching voltage when used at altitudes greater than 2000 m above sea level
< 150 V AC/DC	Max. switching voltage according to the technical data for the device still valid
> 150 V AC/DC	Limited to max. 150 V AC/DC

3. Reduce the maximum ambient temperature for operation by the corresponding factor in accordance with the table below.
4. If derating is specified, offset all the points of the derating curve by the corresponding factor in accordance with the table below.

Altitude above sea level	Temperature derating factor
2000 m	1
2500 m	0.953
3000 m	0.906
3500 m	0.859
4000 m	0.813
4500 m	0.766

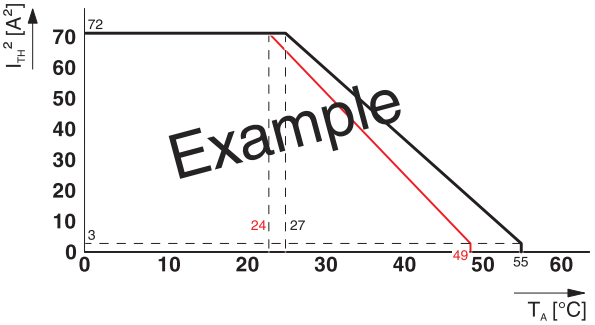
Example calculation for 3000 m

The following calculation and the illustrated derating curve are provided as examples.
Perform the actual calculation and offset the derating curve for the device used according to the technical data and the “Derating” section.

27 °C • 0.906 ≈ 24 °C

55 °C • 0.906 ≈ 49 °C

Figure 9 Example of a suspended derating curve (red)



22.2 Revision history

Version	Date	Contents
00	2020-03-24	First publication
01	2024-05-22	Technical data: Cable length, supply added, suppressor diode removed, air clearances and creepage distances standard removed. Safety regulations and installation instructions section: Specification on SELV/PELV voltage changed. Maintenance, decommissioning and disposal section: Disposal note changed.
		“Interface type (ZVEI classification)” section added, product image changed in “Function description” section, front image changed in “Operating and indication elements” section, notes on connecting the cables added to “Wiring” section.

If you want to inquiry price, you can contact below:

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Company: CW Green Tech